Blast Exposure Research

Characterizing Exposures Associated with M865 and M1002 120 millimeter Tank Training Cartridges

The purpose of this weapon test was to evaluate a new propellant for 120 millimeter tank training ammunition by characterizing blast exposures generated by this new propellant, Radford Propellant Development (RPD)-596, compared to the blast exposures generated by the current M14 propellant used in these cartridges. The M865 target practice, cone stabilized, discarding sabot with tracer (TPCSDS-T) and M1002 target practice, multi-purpose with tracer (TP-MP-T) cartridges were used in this testing. M865 and M1002 120 millimeter tank training cartridges are filled with 596 propellant that is ignited to produce a controlled combustion that propels a projectile toward a target. The chemical composition of propellants affect combustion rates, intensity of blast emitted from the gun muzzle during firing, and injury risk. In a test conducted by Aberdeen Test Center in June 2015, BTDs and noise microphones served as proxy sensors and collected data at four crew positions inside of an M1A1 Abrams tank: commander, driver, gunner and loader. USAPHC evaluators analyzed the sensor data using the BOP-HHA version 2.0 software. This software employs an algorithm based upon experimental data collected from more than 1,000 specimens exposed over 20 years of testing. The BOP-HHA software includes a biomechanical model that analyzes the time-pressure data captured by the BTD to calculate the amount of "push" or mechanical work imparted by the blast pressure wave to the thorax and transmitted to the lung. The calculated work value is used to estimate the risk of lung injury and serves as a predictor of injury since air-containing organs are more susceptible to blast injury. BOP-HHA is the primary methodology used by USAPHC to assess injury risk from the non-auditory component of blast. The results of this analysis were used to develop standard operating procedures that will reduce injury risks to Service Members and operators firing from an Abrams M1A1 tank with M865 and M1002 120 millimeter tank training cartridges fueled by RPD-596 propellant.